

REMARKS

The Applicants would like to thank the Examiner for the interview on August 13, 2002, which was very helpful.

Upon entry of this Amendment, claims 1 and 6 are pending in this application. Claim 1 has been amended to recite a peak integral ratio of hydrogen (H) atoms of from 1.17 to 1.22. Claim 5 is cancelled and claim 6 is new. Support for the claim amendments and the new claim can be found in the specification as filed (see the examples). Consequently, no new matter is introduced as a result of this Amendment. The Applicants respectfully request reconsideration and allowance of this application.

Claim 1 stands rejected under 35 U.S.C. §102(b) as being anticipated by, or in the alternative, under 35 U.S.C. §103(a) as obvious over Takaoka *et al.* (U.S. Pat. No. 4,626,618). Claim 1 also stands rejected under 35 U.S.C. §102(e) as being anticipated by, or in the alternative, under 35 U.S.C. §103(a) as obvious over Gerspacher (U.S. Pat. No. 6,277,350).

As amended, claim 1 recites a product with a specific hydrogen atom (H) ratio range. Neither Takaoka *et al.* or Gerspacher recites, or suggests, any specific ratio of non-conjugated H atoms to aromatic atoms and graphitic H atoms, much less that this ratio is significant. Claim 1 recites a hydrogen atom ratio of 1.17 to 1.22. In addition, both Takaoka *et al.* and Gerspacher prefer carbon blacks that have lower total hydrogen content than 4000 ppm, as claimed in the present invention. All the examples in Table 1 of Takaoka *et al.* have hydrogen content of less than 4000 ppm; Gerspacher, column 3, lines 35 to 36, specifically states that “the lower the hydrogen content, the better.” Therefore, claim 1 is neither anticipated by, nor obvious over, Takaoka *et al.* and/or Gerspacher. During the interview, the Examiner indicated that a claim with a lower limit of 1.17 would distinguish the present application from the references cited.

Claim 5 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Takaoka *et al.* Claim 5 also stands rejected under 35 U.S.C. §103(a) as being unpatentable over Gerspacher. This claim has been cancelled and been replaced by claim 6.

The Examiner alleges that the high  $\pi$ -structure of the materials in Takaoka *et al.* and the conjugated structure of the materials in Gerspacher are indicative of high electron mobility, which in turn makes them effective electrolytic materials, and that using carbon in

an electrode system is an obvious expedient. The Applicants disagree for at least the following reasons.

First, there is no scientific evidence of record showing that electron mobility is directly correlatable to catalytic activity. Just because a compound has good electron mobility does not necessarily mean that it is a good catalyst (e.g., benzene). Second, claim 6 recites an electrocatalyst in which a carbon black having a specific H ratio is used as a support material for noble-metal catalysts (e.g., Pt and Ru). The electrocatalysts in both Examples 1 and 2 have concentrations of 80% carbon black. An electrocatalyst derives its rigidity from the carbon black support, and therefore, this support has to contain a substantial amount of carbon black (at least 40 wt.%). Low concentrations of carbon black, for example 2% (as noted by the Examiner in the interview), would not result in an effective electrocatalyst.

In addition, the Tables on pages 11 and 12 show that the performance of the cells using the electrocatalysts produced from the carbon black of the present invention is better than the electrocatalysts produced from carbon blacks having low H content. Note that the voltages (U) in both tables, which are measures of catalyst activity, are higher for both Example 1 and 2 when compared to the Comparative Examples 1 and 2. For instance, the cell performance at 400 mA/cm<sup>2</sup> using O<sub>2</sub> as the fuel gas of Example 1 (carbon black of the present invention) is 687 mV vs. 630 mV for the Comparative Example 1 (carbon black Vulcan XC-72 R).

Similarly, the cell performance at 500 mA/cm<sup>2</sup> of Example 2 (carbon black of the present invention) is 715 mV vs. 686 mV for the Comparative Example 2 (carbon black Vulcan XC-72 R). In addition, the voltage drop, which occurs after the addition of 100 ppm CO (a catalyst poison) to the fuel gas ( $\Delta U$ ) is also less in Example 3 (-54 mV) vs. Comparative Example 2 (-66 mV) indicating that the catalyst formed by the present invention has a better CO tolerance than that formed from the comparative examples.

Therefore, both the amount of carbon black in the catalyst and the specific ratio of H atoms are important and new claim 6 is neither anticipated by, nor obvious over, Takaoka *et al.* and/or Gerspacher.

CONCLUSION

Claim 1 has been amended to recite carbon blacks containing a specific ratio hydrogen atoms. Claim 5 was cancelled and claim 6 was added; new claim 6 is directed to an electrocatalyst. The amended claim and the new claim are neither anticipated by, nor obvious over, Takaoka *et al.* and/or Gerspacher. Consequently, the Applicants submit that this application is in condition for allowance and a timely Notice to that effect is respectfully requested. Should questions relating to patentability remain, the Examiner is invited to contact the undersigned to discuss the same.

Attached hereto is a marked-up version of the changes made to the application by the current amendment. The attached Appendix is captioned "**Version with markings to show changes made**".

Respectfully submitted,

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**APPENDIX**  
**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

IN THE CLAIMS:

1. (Amended) A furnace carbon black, having a hydrogen [(H)] content of greater than 4000 ppm, determined by CHN analysis, and a peak integral ratio, determined by inelastic neutron scattering [(INS)], of non-conjugated hydrogen [H] atoms ( $1250\text{ cm}^{-1}$ – $2000\text{ cm}^{-1}$ ) to aromatic and graphitic hydrogen [H] atoms ( $1000\text{ cm}^{-1}$ – $1250\text{ cm}^{-1}$  and  $750\text{ cm}^{-1}$ – $1000\text{ cm}^{-1}$ ) of [less than] from 1.17 to 1.22.